

# ***Baxter***

## **OPERATOR'S MANUAL**

### **ExtraPure Reverse Osmosis System**



# WARNINGS AND CAUTIONS

As used in this manual, the term **WARNING** is used to indicate a condition that could cause injury to a person. The term **CAUTION** indicates a condition that could cause damage to the machine.

## WARNINGS

After installation, the ExtraPure RO System must be sanitized and rinsed before using it to supply water for dialysis.

Do not operate the ExtraPure RO System with the water quality needle in the red zone.

With a regular dialysis regimen, sanitize the ExtraPure RO System at least once a week, or as your physician recommends.

Whenever the ExtraPure RO System will not be used for seven days or more, it should be stored with formaldehyde disinfectant solution in the fluid path. Follow the steps for "Sanitizing" in the Operator's Manual. Always rinse the ExtraPure RO System and test for disinfectant before using it to supply dialysis water.

The disinfectant port cover must be securely in place before turning on the ExtraPure RO System to guard against backsplash. Remember to replace the cover after injecting the sanitizing agent.

## CAUTIONS

If the ExtraPure RO System is operated with the water off, the pump will shut down.

The filter should be changed whenever the product water is below AMMI Standards, the difference between the front panel pressure gauges is greater than 10 psi, after 65 hours of operation, or as recommended by your dialysis clinic.

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# INTRODUCTION

The ExtraPure Reverse Osmosis (RO) System supplies high-quality dialysis water to hemodialysis machines. Impurities in dialysis water could diffuse into the blood inside an artificial kidney, so water used to make dialysate must be as pure as possible. The reverse osmosis membrane is designed to allow water molecules across and leave impurities behind.

## Operation Overview

As illustrated in Figure 1 on page 2, the ExtraPure RO system uses an incoming water filter, a heat exchanger, a reverse osmosis membrane, and two recirculating water loops.

- ♦ The filter removes solid particles and chlorine from the feed water before it reaches the RO membrane.
- ♦ The heat exchanger warms the incoming water, which increases pure water production and reduces energy use.
- ♦ The reverse osmosis membrane removes bacteria, inorganics, and pyrogens.
- ♦ The product water loop feeds surplus pure water back to the RO membrane.
- ♦ The high-volume loop keeps the RO membrane flushed.

The ExtraPure RO System can produce more pure water than is needed for single-patient dialysis. Instead of wasting surplus pure water down the drain, recirculation saves this water and recycles it to improve the quality of the water feeding the RO membrane.

The ExtraPure System monitors water quality and regulates water pressures and drain flows. Constant adjustments are not necessary, and the operator can devote full attention to dialysis.

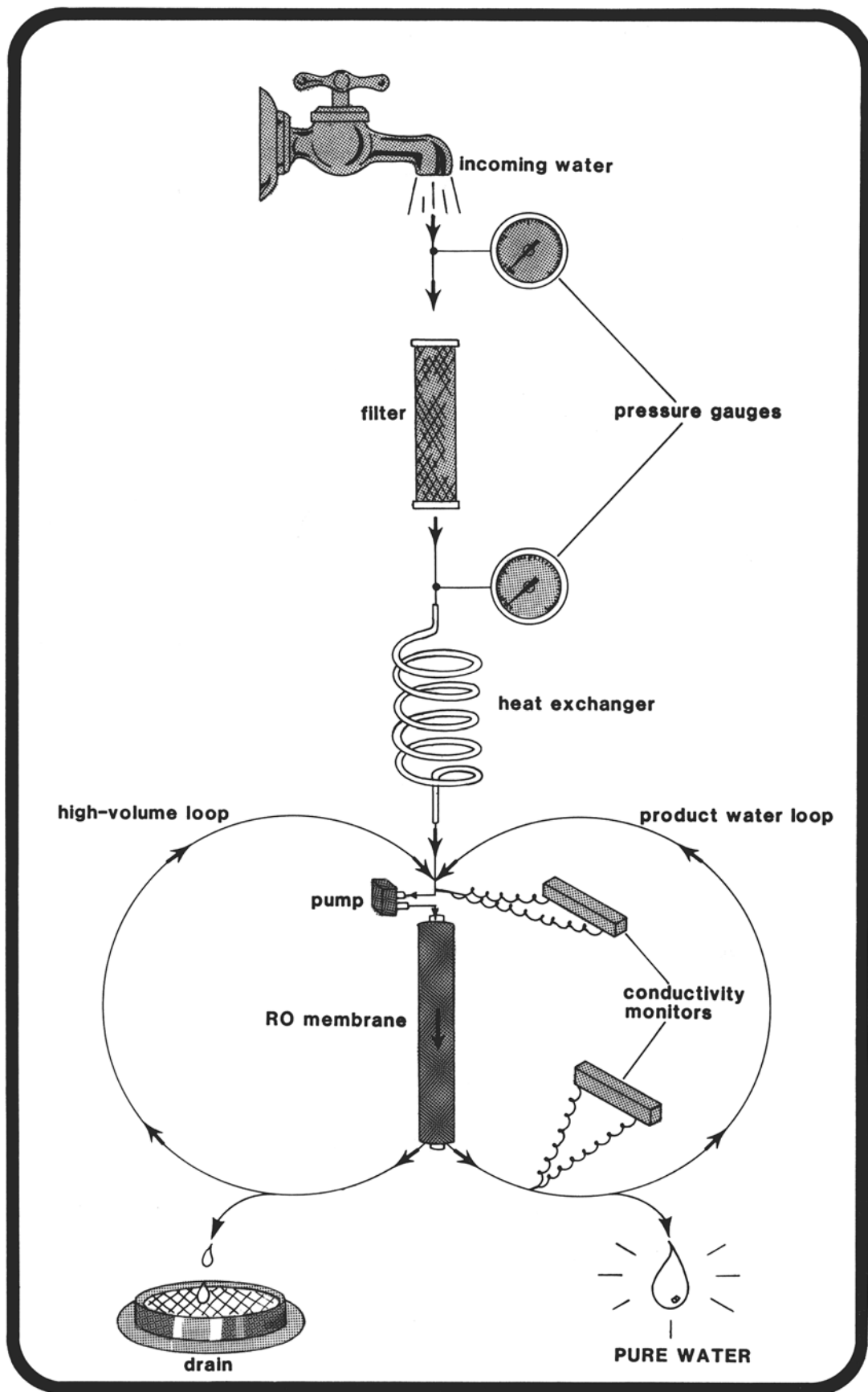
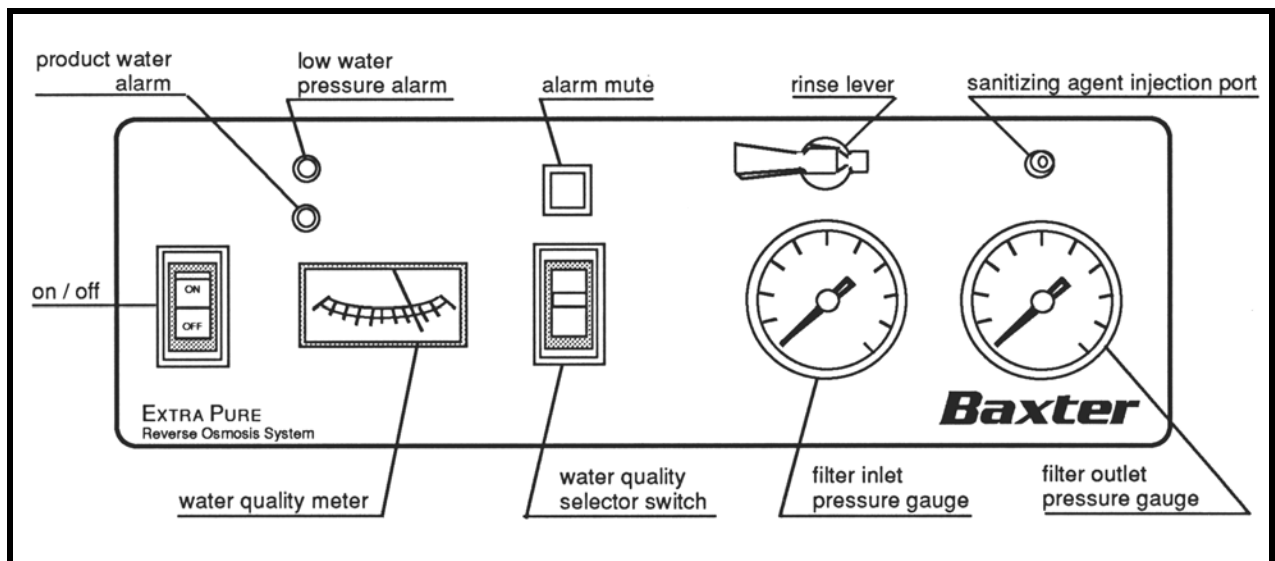


Figure 1: ExtraPure RO System overview



## Water Quality Chart

Move the selector switch and read the water quality meter. Find the chart column closest to the actual meter reading and read down for the conductivity in microsiemens ( $\mu\text{S}/\text{cm}$ ) and approximate total dissolved solids (TDS) in parts per million (ppm) or for percent rejection.

### PRODUCT WATER

meter	2	2.5	3	4	5	6	7	8	9	10
conductivity ( $\mu\text{S}/\text{cm}$ )	126	49	31	17	12	9	8	6	6	5
approximate TDS (ppm)	85	33	21	12	8	6	5	4	4	3

### % REJECTION

meter	red	yellow	green
% rejection	below 80%	80%-89%	90% and greater

### RECIRCULATION WATER

meter	1.5	2	3	4	5	6	7	8	9	10
conductivity ( $\mu\text{S}/\text{cm}$ )	1451	871	484	335	256	207	174	150	132	118
approximate TDS (ppm)	980	588	327	226	173	140	117	101	89	79

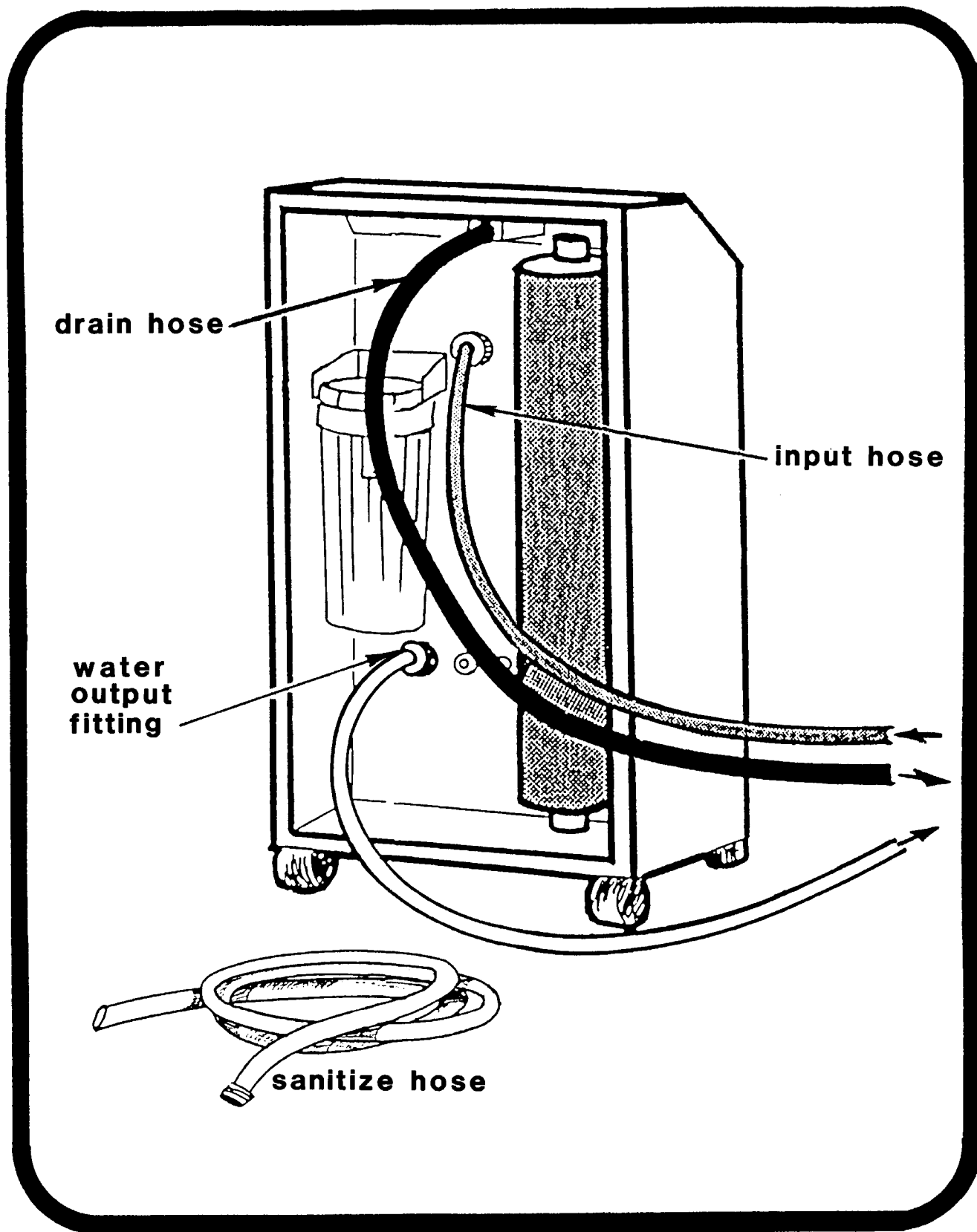


Figure 2: Rear view of RO unit



## Operator's Controls

The filter inlet and filter outlet pressure gauges monitor the water pressure on both sides of the incoming water filter. The pressure difference between the two gauges should always be less than 10 psi. If the pressure difference is greater than 10 psi, the filter must be changed.

The water quality meter monitors the quality of the water on the inlet and outlet side of the reverse osmosis membrane and thus monitors the integrity of the RO membrane. The green zone of the meter indicates that at least 90% of all dissolved solids are being rejected by the RO membrane. The yellow zone shows 80 to 89% rejection. Less than 80% rejection (red zone) indicates that the reverse osmosis membrane needs to be replaced.

### **WARNING:**

**Never operate the ExtraPure RO System with the needle in the red zone.**

The three-position selector switch allows the meter to display the water quality of either the recirculating water or the product water. Consult the water quality chart to determine conductivity in microsiemens ( $\mu\text{S}/\text{cm}$ ) and total dissolved solids in parts per million (ppm).

The low water pressure alarm will activate when the incoming water pressure drops below 5 psi. The product water alarm indicates that the output water to the dialysis system has a conductivity of more than 118  $\mu\text{S}/\text{cm}$ . The percent rejection alarm (needle in the red zone) indicates that the RO membrane rejection is less than 80% and the RO membrane may need replacement. Audible alarms can be silenced with the alarm mute button. Also on the operator's control panel are the ON/OFF switch, the rinse lever, and the sanitizing agent injection port.

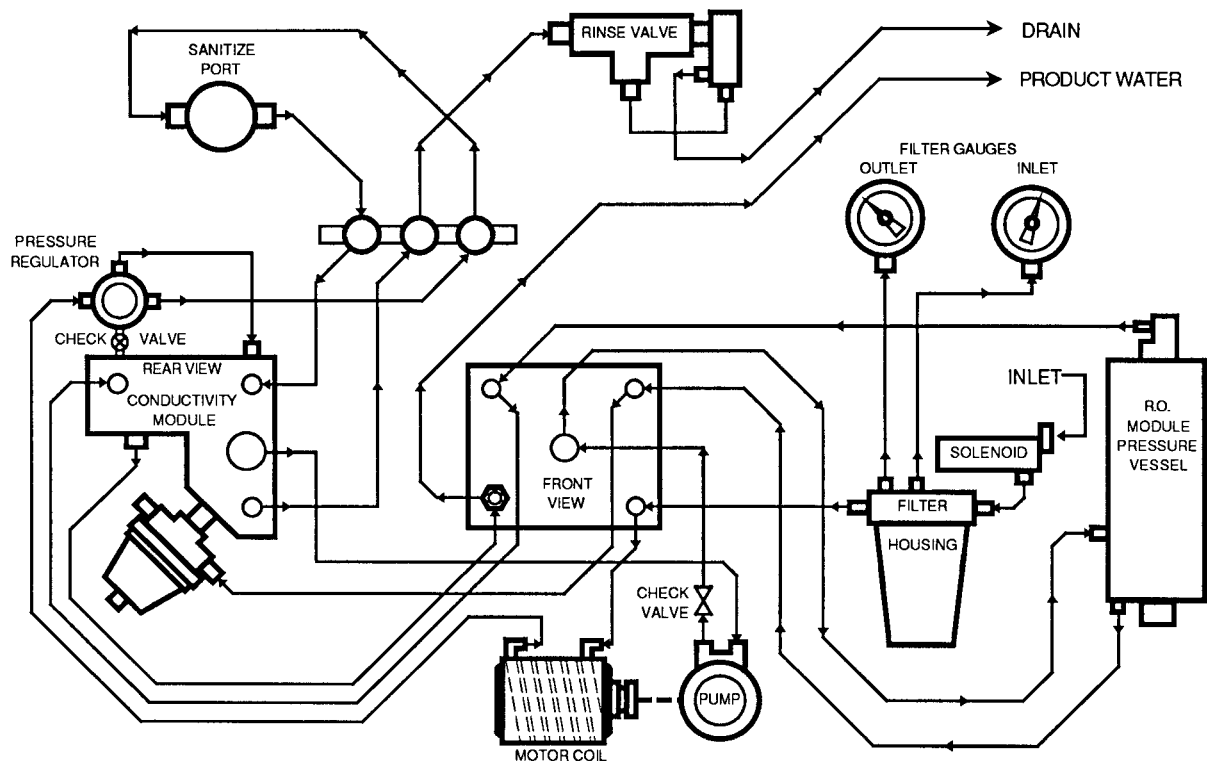


Figure 3: RO Flow Diagram

## Flow Diagram Component Identification

Component	Purpose
Solenoid valve	Opens to allow water to enter the RO. Closes when the unit is turned off. It ensures that the disinfectant used in disinfecting the unit remains inside the instrument until it is turned on again.
Water pressure gauges	Located before and after the water filter. When the difference between the two gauge readings is greater than 10 psi, the filter should be changed.
Filter	Contains both a fiber material (5-10 micron) and activated carbon. The carbon is sufficient for 13 treatments (for the home, about one month) if the incoming water contains less than 3 ppm chloride ions. <b>For higher chloride levels and chloramines, additional activated carbon may be needed.</b>
Heat exchanger	Tubing around the pump motor to cool the motor and warm the water. This is done so the motor can be enclosed in insulation without overheating and warmer water assists the membrane in producing quality water.
Water pressure regulator (20 psi)	Regulates the water pressure to the Procon pump at 20 psi.
Sanitize Luer port	Used to inject disinfectant into the RO for sanitizing the machine.
Sanitize check valve	Prevents back up of water or disinfectant through the sanitize Luer port.
Water pressure switch	Set at about 6 psi. Should the incoming pressure drop below this amount, the Procon pump will be shut off and an alarm will sound.
Thermistor	Used to monitor the water temperature. This information is used in conjunction with the two conductivity cells to determine the total ion concentration of the recirculating and product water.
Conductivity cells	Used to measure the conductance of the recirculating and product water. This information is combined to yield the display of percent rejection on the front panel.
Procon pump	Pump used in RO to push the water across the membrane. The pump can produce pressures much higher than the 200 psi which is necessary in the RO.
RO module	Contains the thin film composite (TFC) membrane, which is the heart of the system.
Test points	Plugged holes in the system's flow block, which can be used by service personnel to test pressures and set the pressure regulators.
Pressure regulator (200 psi)	Provides the backpressure necessary for the Procon pump to create the 200 psi required to push water across the membrane.
Flow regulator	A restrictor used to limit the flow of water to the drain during normal function. The drain flow is about 1000mL/min.
Fast rinse valve	Opened to create a high flow to drain when rinsing disinfectant from the system. This reduces the waiting time before the unit can be used.
Check valve (product line)	Used to prevent incoming or recirculating water from entering the product line. Because this valve is 1 psi, the output water pressure will be 21 psi to the dialysis machine.

## Specifications

Name	ExtraPure Reverse Osmosis System
Electrical supply	117 VAC 60/50 Hz or 230 VAC 60/50 Hz, 580 W, 6.5 A/3.3 A
Incoming water supply pressure	20-100 psi (138-690 kPa)
Filter	5-micron carbon filter (P/N 407-8502-014)
Maximum water hardness without softening	Depends on pH of feed water
Membrane configuration	Spiral wound
Membrane material	Thin film composite -- polyamide
Membrane pH tolerance of input water	3.0- 10.0
Operating temperature, minimum output of 500 mL/min	5°C to 35°C (41°F to 95°F)
Rated output at 25°C (77°F) input water temperature	500 - 1,100 mL/min minimum
Rated output at 5°C (41°F) input water temperature	525 mL/min minimum
Size unit	Depth - 406 mm (16") Width - 406 mm (16") Height - 710 mm (28")
Weight	27 kg (60 lb)
RO membrane operating pressure	200 psi (1,380 kPa)
Membrane integrity/conductivity monitors	Dual cell conductivity temperature compensated, show % rejection and absolute conductivity in microsiemens
Low water pressure alarm	5 psi (35 kPa)
Rejection of dissolved salts	90-98%
Rejection of organism (mol wt. greater than 300), bacteria, pyrogens	Greater than 99%
Output pure water pressure	21 psi (145 kPa)
Disinfectant	37% aqueous formaldehyde or Hydrogen Peroxide / Peroxyacetic Acid disinfectant depending on model.

# STARTUP

## Water Supply

Every water supply is different and should be tested to determine the water treatment required. Always have your water supply tested before connecting the ExtraPure RO System. In some areas, water softening or other pre-treatment may be required.

### Water Supply Requirements

- ♦ Water supply: 7.5 liters per minute (2.2 gallons per minute) minimum
- ♦ Pressure between 20 and 100 psi
- ♦ Water temperature between 5°C and 35°C (41°F and 95°F)
- ♦ Water pH between 3.0 and 10.0
- ♦ Drain capability of 3 liters per minute (0.78 gallons per minute)
- ♦ Negative test for scaling (Langlier saturation index)

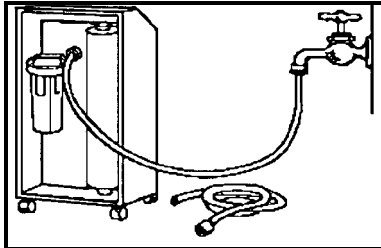
## Unpacking

After inspecting the shipping container for damage, open the box, remove all packing materials, and inspect for damage. Report all damage promptly to the shipping company and make a claim for compensation. Damage caused in shipment is not covered by the equipment warranty. Save the shipping carton and packing material for inspection and verification of your claim.

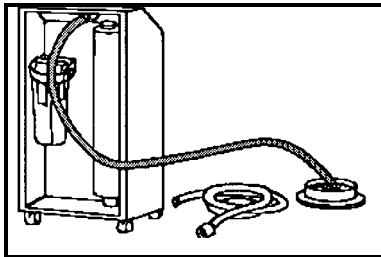
Inspect the ExtraPure RO System for leaks after unpacking. The ExtraPure RO System is shipped with a new membrane, an input hose, a drain hose, a sanitize hose and a new water filter.

The ExtraPure RO System must be disinfected prior to use. Follow procedures on page 16 and page 17 or according to your clinic's recommendation.

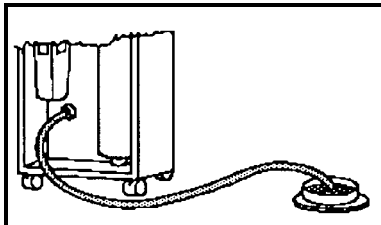
**Installing** The ExtraPure RO System's hoses are shipped with caps on them. Remove these caps before connecting the hoses.



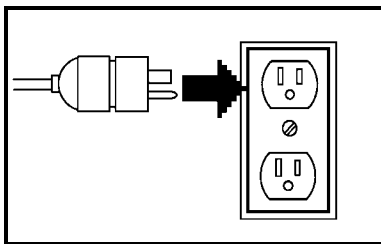
1. Connect the input hose to the water supply. The connection is a 3/4" female garden hose connection. Use rubber washers on all connections.



2. Place the drain hose in the drain.

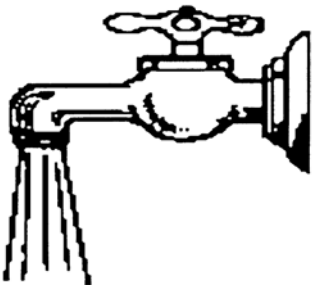
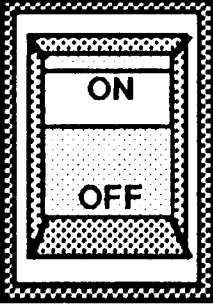
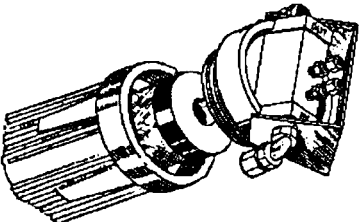


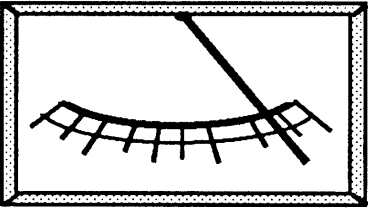
3. Connect the sanitize hose to the ExtraPure RO System product water fitting (3/4" male garden hose) and place the open end in the drain.



4. Check for proper voltage and then plug in the unit.

## Initial Rinse

	<ol style="list-style-type: none"> <li>1. Turn on the water supply. Check for leaks. You should not hear water running through the unit until it is turned on.</li> </ol>
	<ol style="list-style-type: none"> <li>2. Lift the rinse lever and turn on the ExtraPure RO System with the ON/OFF switch on the control panel. Look for water flowing through the drain line and sanitize hose.</li> </ol>
	<ol style="list-style-type: none"> <li>3. Run the ExtraPure RO System for 15 minutes to rinse the fluid path.  <p>After 15 minutes, turn off the unit to install the filter in its blue housing.</p> <p>Unscrew the housing counter-clockwise and carefully remove it. There will be water in the housing.</p> <p>Empty the housing completely and refill partially with fresh water. Then slide the new filter into place and reinstall the housing. The fresh water in the housing prevents excessive air in the fluid path.</p> <p>After startup, never operate the ExtraPure RO System without the filter. Do not use any filter other than the specified Baxter 5-micron carbon filter (P/N 407-8502-014 or 5M1315).</p> </li> </ol>
<h1>RINSE!</h1>	<ol style="list-style-type: none"> <li>4. Rinse the ExtraPure RO System by lifting the rinse lever on the control panel and letting the unit run for 15 minutes.</li> </ol>

	<p>5. Lower the rinse lever. After a few minutes, water quality should be normal and the water quality meter on the control panel should read in the green zone (above 90% rejection).</p>
<p><b>Product</b> _____</p> <p><b>% Rejection</b> _____</p> <p><b>Recirculation</b> _____</p>	<p>6. Use the three-position selector switch on the control panel to determine the values of the product and the recirculation water. Write these down for future reference. If the needle goes off the right side of the scale, refer to the Troubleshooting section of this manual.</p>



## **Normal Operation**

1. Rinse and then test for residual disinfectant according to your clinic's recommendation before connecting the ExtraPure RO System to the dialysis machine.
2. Turn on the water and turn on the ExtraPure RO System.
3. Note the filter pressure readings at the beginning of use. The difference between filter/inlet pressure and filter/outlet pressure should always be less than 10 psi with no water pressure alarm.

### **CAUTION:**

**The filter should be changed whenever the product water is below AMMI Standards, the filter inlet/outlet pressure difference is greater than 10 psi, after 65 hours of operation, or as recommended by your clinic.**

## **Cleaning the Membrane**

**Note: This is not a sanitizing procedure. Follow procedures on page 16 or 17 to sanitize the system.**

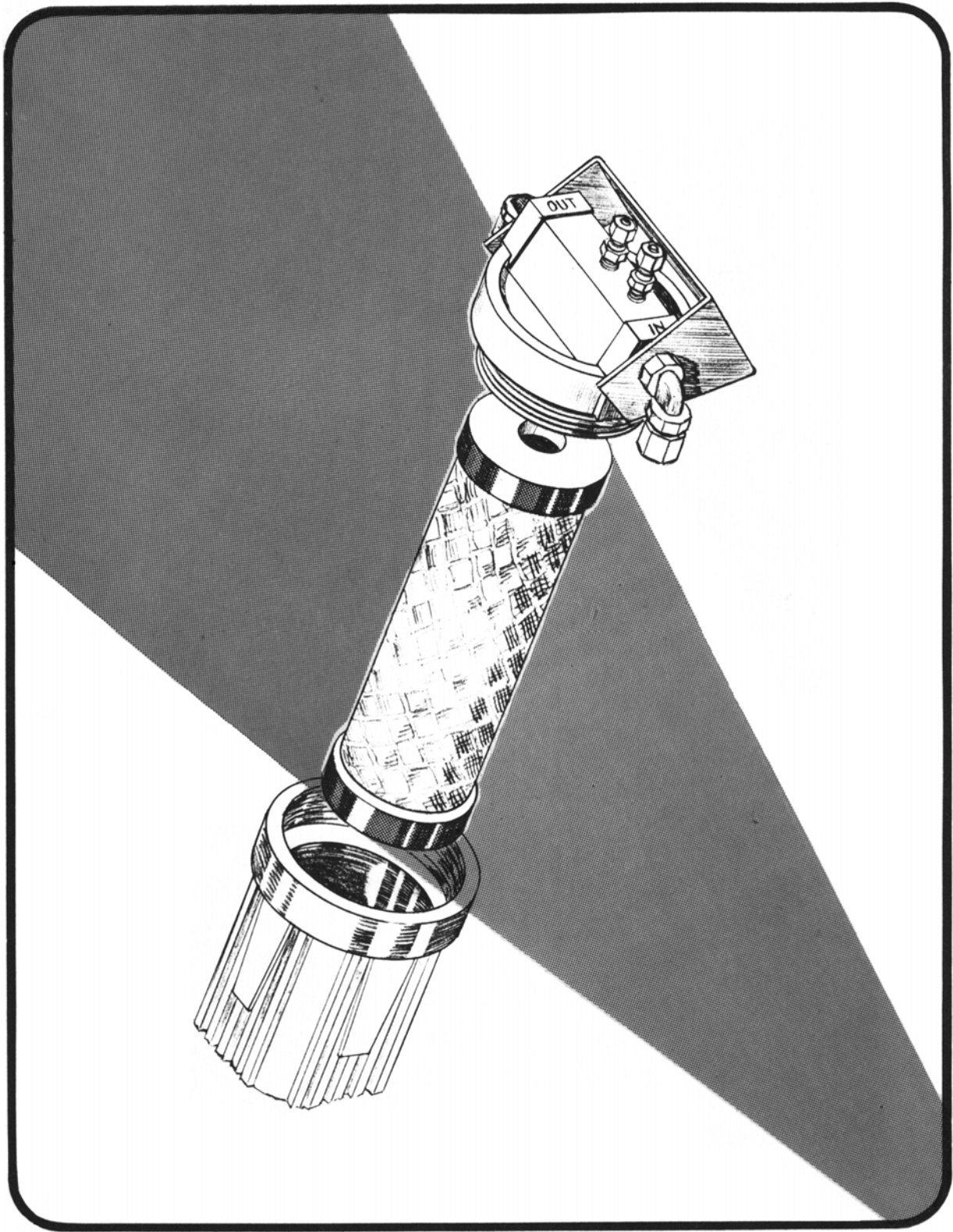
1. Disconnect the product water line from the RO and install the sanitize hose. Place the open end of this hose in the drain.
2. Inject 200-300 ml of white vinegar into the sanitization port. Turn the RO on, let the machine run for 1 minute, then turn the machine off and let it stand overnight.
3. After allowing the vinegar to dwell overnight, turn the RO on and lift the rinse lever to the rinse position. Rinse the machine for 15 minutes.
4. Check pH to verify all the vinegar has been flushed out of the RO. If pH is not in the acceptable range continue the rinse until the pH is within limits.
5. Lower the rinse lever to the operating position and check the water quality meter to ensure the needle is in the green zone. (If not the membrane will need to be replaced.)
6. Turn the RO off.
7. Disconnect the sanitize hose from the RO and reconnect the product water line to the RO.
8. Place the rinse lever in the run position.

The RO is now ready to be put back in service or to Sanitize as outlined on page 16 thru 19.

## **Filter Replacement**

The ExtraPure RO System uses a disposable cartridge filter as illustrated in Figure 4. The filter should be replaced if the product water is below AMMI Standards, if the inlet/outlet pressure difference is more than 10 psi, or if the filter has been used more than 65 hours (13 dialysis treatments).

1. Turn off the water to the unit.
2. Unplug the ExtraPure RO System.
3. To relieve the water pressure inside the unit, disconnect the water line to the dialysis machine and place it in a clean bucket to avoid contamination.
4. Unscrew the blue filter housing (rear compartment of unit) by turning it counterclockwise. The housing will have water in it. Pour off the water and set the housing aside.
5. Remove and discard the old filter.
6. Replace with a new Baxter 5-micron carbon filter (P/N 407-8502-014 or 5M1315). **DO NOT USE ANY FILTER OTHER THAN THE FILTER SPECIFIED.** Partially fill the housing with fresh water to prevent excessive air in the fluid path. Then slide the filter into place and carefully reinstall the housing.
7. Turn on the water supply and plug in the ExtraPure RO System. Run the unit for 15 minutes with the rinse lever on the control panel in the rinse position. After rinsing, return the rinse lever to the normal operating position.



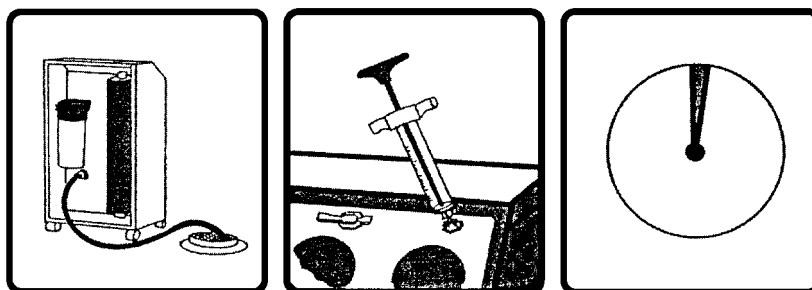
*Figure 4: Filter assembly*

# SANITIZATION

## Sanitizing a Formaldehyde RO and Storage Procedure

**WARNING: Store all Disinfectants out of reach of children**

1. The ExtraPure RO System should be sanitized at least once a week with regular use, or follow your clinic's recommendation, to prevent bacteria building up in the water path. Use only 37% aqueous formaldehyde solution (Formalin™).
2. With the unit off, disconnect the water line connecting the ExtraPure RO System to the dialysis machine. In its place, connect the sanitize hose. Place the end of the sanitize hose in the drain. Ensure the drain hose is in the drain.
3. Carefully inject 100 cc Formalin™ into the disinfectant port. Slowly inject the Formalin™ into the disinfectant port on the control panel. Then inject 50 cc water and reinstall the sanitize cap.
4. Turn on the unit and let it run for 30 - 45 seconds with the rinse lever in the operating position. (If storage time will be more than three days, remove filter and housing, and allow to air-dry.)
5. Turn off the ExtraPure RO System and turn off the feed water. Let the RO unit stand with the Formalin™ disinfectant in it until rinsing, according to your dialysis regimen and your clinic's recommendation. (If storage time will be more than three days, remove filter and housing, and allow to air-dry.)
6. Rinse the Formalin™ solution from the RO for at least 15 minutes with the rinse lever in the up position. Rinse until output water tests negative for Formalin™ residuals according to your clinic's procedures. See page 19.
7. Turn off the ExtraPure and the feed water. Disconnect the sanitize hose and reconnect the product water line to the dialysis machine.



### NOTE

*In a 7-day period, a typical dialysis regimen will have one interval between treatments longer than the other interval(s). For convenience, this longer interval can incorporate the sanitization of the ExtraPure RO System. For example, in the dialysis schedule shown, with treatments on Monday, Wednesday, and Friday, sanitize the ExtraPure RO System after dialysis on Friday and rinse the unit before dialysis on Monday.*

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

## **Sanitizing a Hydrogen Peroxide/ Peroxyacetic Acid Disinfectant Compatible Reverse Osmosis System**

### **CAUTION:**

**Make sure the device you will be using is model 5M5509 or FM4644. Use of Hydrogen Peroxide and Peroxyacetic Acid in a non-compatible machine will cause premature deterioration of components. The ExtraPure RO System should be disinfected with Formaldehyde if the system will sit idle for more than seven days. Refer to page 16 "Sanitizing a Formaldehyde RO and Storage Procedure."**

The ExtraPure RO System should be sanitized at least twice a week with regular use, or follow your clinic's recommendation, to prevent bacteria building up in the water path. Use 100% disinfectant that is made with 22% Hydrogen Peroxide and 4.5% Peroxyacetic Acid.

Minntech® manufactures a product called Minncare® for this purpose.

### **WARNING: Store all Disinfectants out of reach of children.**

1. With the unit off, disconnect the water line connecting the ExtraPure RO System to the dialysis machine. In its place, connect the sanitize hose. Collect at least 50 cc of product water from the sanitizing hose. This product water will be used in step 2. Then place the end of the sanitize hose in the drain. Ensure the drain hose is in the drain.
2. Carefully inject 60 cc of Hydrogen Peroxide/ Peroxyacetic Acid into the disinfectant port on the control panel, and then inject 50 cc of the product water collected in step 1. Reinstall cap on sanitize port.
3. Verify the rinse lever is in the operating position. Turn on the unit and let it run for 30 to 45 seconds.

4. Turn off the ExtraPure RO System and turn off the feed water. Let the RO unit stand idle until rinsing, according to your clinic's recommendation. The disinfectant must dwell in the system for two hours.

***Notice: Damage to the system may result if the dwell time is longer than two hours and the membrane is fouled by one of the following conditions: 1. Heavy metals in the water source such as iron 2. Inorganic matter in the water source 3. The pH level is higher than 5.***

5. Rinse the Hydrogen Peroxide/ Peroxyacetic Acid solution from the RO for at least 15 minutes with the rinse lever up. Rinse until output water tests negative for Hydrogen Peroxide/ Peroxyacetic Acid residuals according to your clinic's recommendation. See the next page.

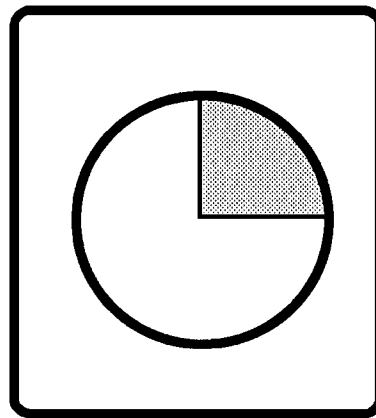
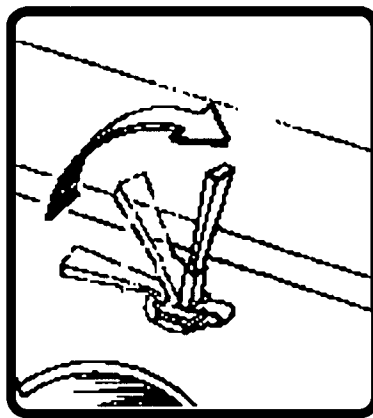
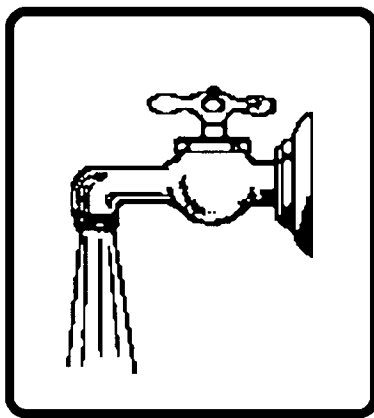
**CAUTION: The Hydrogen Peroxide / Peroxyactic Acid should never dwell in the system longer than twelve hours. For long-term storage follow the procedure using Formaldehyde.**

## Rinsing

### WARNING:

**After sanitizing, you must rinse the ExtraPure RO System before using it to supply dialysis water.**

1. Turn on the feed water.
  - Lift the rinse lever on the control panel to the RINSE position.
  - Turn on the ExtraPure RO System.
  - Let the ExtraPure run for at least 15 minutes.
2. After 15 minutes rinsing, test the product water (sanitize hose) for residual disinfectant according to your clinic's recommendation. Continue rinsing until the test is negative.



3. When the test for disinfectant is negative, place the rinse lever in the OPERATE position. The ExtraPure RO System is ready for operation when the water quality meter reads in the yellow or green zones.
4. Turn off the ExtraPure RO System and the feed water.
5. Remove the sanitize hose and reconnect the product water line to the dialysis machine.

# MAINTENANCE

Required periodic maintenance includes inspections for leaks, cleaning, sanitation, and filter replacement.

## Recommended Tools to Maintain One ExtraPure RO

Tool	Part Number
Hach Water Test Kit	413-0001-026
Myron L Total Dissolved Solids Meter	499-4000-032
0-30 psi gauge	403-8500-004
0-400 psi gauge	403-8500-009
Filter Wrench	413-0001-013

## Recommended Spare Parts to Maintain One ExtraPure RO for One Year

Catalog Page #	Item	Part Number	Description	Quantity
1	3	407-8502-014	Charcoal Filter, 5 micron	As needed
3	35	908-5000-176	RO Filter Element	1
4	7	157-1232-255	Sanitizing Port Cap	1
4	23	402-9862-132	Sanitizing Port Female Luer-Lok	1

## Inspection for Leaks

Before each dialysis treatment, check for leaks at the hose connections, filter housing, and cabinet assembly. If leaks cannot be corrected, call Baxter Instrument Services 1-800-553-6898.

## External Cleaning

Clean the outside of the ExtraPure RO System cabinet with a solution of water and a mild detergent. If additional cleaning is needed, use a solution of half water and half household bleach.



# TROUBLESHOOTING

Basic troubleshooting procedures are given below. If these procedures do not correct the problem, call Baxter Instrument Services at 1-800-553-6898.

## Alarms

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Product alarm	High product TDS caused by a torn membrane.	Change the membrane.
	High product TDS caused by an occluded drain orifice. (No flow at drain when rinse valve is down.)	Clean the drain orifice or change the flow controller assembly.
Low pressure alarm	Water not turned on.	Turn on the water.
	The filter needs to be changed.	Check filter gauges. Change filter if necessary.
	20 psi regulator is not properly adjusted	Install a gauge in the proper port; adjust the regulator.
	Water pressure switch is broken	Replace the switch.

## Electrical

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Motor does not run	ON/OFF reset switch in back of the machine set at OFF.	Switch to ON.
Fails electrical leakage test	Power supply, power cord, pump/motor, and wiring.	Replace or call Baxter Instrument Services.
Unable to adjust +12 Volts to $\pm 0.1$ VDC	Power supply	Replace or call Baxter Instrument Services.
Unable to adjust -12 Volts to $\pm 0.1$ VDC	Power supply	Replace or call Baxter Instrument Services.

<b>SYMPTOM</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
Moisture around conductivity cell electrodes	Electrodes	Replace or call Baxter Instrument Services.
With water off, no alarms & pump runs, or mute inoperative	PCB, pressure switch, wiring, alarm mute switch, inlet.	Replace or call Baxter Instrument Services.
Meter indication or logic inaccurate	Meter, PCB, thermistor, wiring, 3 position switch, product water LED, Sonalert alarm, conductivity cells	Clean, calibrate or replace as necessary, or call Baxter Instrument Services.
RO recirculation cell is < 10 X RO product cell	Meter, PCB, power supply, electrodes, thermistor, RO module or vessel, filter, wiring	Clean, calibrate or replace as necessary, or call Baxter Instrument Services.

## Flow

<b>SYMPTOM</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
Proper input water pressure, but no output	Pump motor not running, motor overload protector stopping motor.	Verify that the conductivity cell connection is secure. Check motor connections.
Unable to regulate product flow to 500 mL/min	PCB, power supply, pressure switch, power cord, relay, pump/motor, RO module/vessel, low pressure regulator, wiring, inlet water solenoid, on/off SW/CRT breaker	Calibrate or replace as necessary, or call Baxter Instrument Services.
Unusual noise coming from the pump	Filter partly clogged and not supplying enough water.  Pump pressure to RO membrane low.	Change the filter.  Replace pump head or call Baxter Instrument Services.
Water running out of the cabinet	Leak inside the unit.	Look for loose connections. Tighten or repair with Teflon tape or silicon RTV. If unable to repair, call Baxter Instrument Services.
Drain flow < 800 mL/min	Pump or motor, RO module or vessel	Replace or call Baxter Instrument Services.
Product flow < 1100 mL/min	Pump or motor, RO module or vessel, Inlet water temperature is below 25° C.	Replace or call Baxter Instrument Services.
Drain flow w/fast rinse switch up < 1500 mL/min	Pump or motor, RO module or vessel. Fast rinse switch block	Replace or call Baxter Instrument Services.

## Pressure

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Output water pressure low	Reverse Osmosis membrane aged, capacity has fallen below specification due to use and scaling.  Pump pressure to RO membrane low.	RO membrane will need to be cleaned or replaced. Call Baxter Instrument Services.  Replace pump head or call Baxter Instrument Services.
Water pressure gauges vibrate	Incoming water pressure is too high.	Install an incoming water pressure regulator.
Difference between water inlet/outlet gauges > 10 psi	Filter, pressure gauges	Replace filter/gauges or call Baxter Instrument Services.

## Water Quality

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
Water quality as indicated on the water quality meter is in the red zone (below 80% rejection)	This condition can be caused by a number of related conditions: 1. Failure of the RO membrane. 2. Degradation of the RO membrane but not a membrane leak. 3. Flow and pressure conditions within the unit have changed so that the % yield has increased significantly.	Do not operate with water quality meter in the red zone. Call Baxter Instrument Services.  Check conductivity reading with the three-position switch.  Call Baxter Instrument Services
Water quality not in green, but quality is good	Meter, PCB, power supply, electrodes, thermistor, RO module/vessel, filter, wiring	Clean, calibrate or replace as necessary, or call Baxter Instrument Services.
Water quality meter reads off the right side of the scale	Open electrical connection in conductivity circuit.	Call Baxter Instrument Services.

<b>SYMPTOM</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
% rejection indicator is in the red zone, audible alarm.	Incoming TDS is less than 150 ppm (calculated % rejection is less than 80%).	Install a 5K resistor in parallel with the recirculation conductivity cell.
	Membrane is scaling.	Inject 200-300 ml white vinegar into the sanitization port, let the unit run for 1 minute, then let it stand overnight.
	Internal water pressure regulators are not set properly.	Install gauges in the ports provided, then set the product and recirculation regulators at 20 psi and 200 psi, respectively.
	Drain orifice is occluded.	Clean the drain orifice or replace the flow controller assembly.
% rejection indicator is in the red zone but there is no audible alarm.	Meter is not calibrated.	Calibrate the meter.
	% rejection offset is not calibrated.	Calibrate the % rejection offset.
Product water chlorine exceeds AMMI Standards	Filter may be saturated with chlorine.	Change the carbon filter.

## Calibration of Electronics

**CAUTION:** The following procedure should only be performed by a qualified technician. Call Baxter Instrument Service at 1-800-553-6898.

**% Rejection Meter Adjustment R55:** For the recirculation cell, substitute a 4K resistor (10% or better). For the product cell, substitute a 20K resistor. Adjust R55 so that the meter rests on the red-yellow border.

**% Rejection Meter Adjustment R56:** With the same resistors in place, connect the voltmeter to TP2. Adjust R56 for the point at which the voltage changes from low to high. You will not be able to use the LED as a reference due to the delay.

### Product Alarm Adjustment R44:

1. Short out the recirculation cell.
2. Substitute 11.2K resistor for product cell.
3. Hook voltmeter to TP1.
4. Adjust R44 for point at which voltage changes from low to high.

### NOTE

*This adjustment is sensitive to ambient thermistor temperature.*

You will not be able to use the LED as a reference due to the delay.

**Monitor Check:** With the 4K and 20K resistors in place as in the first calibration, you should be able to get the following readings on the water quality meter.

Product	1.5 - 3.5
Recirculation	4.0 - 6.0
% Rejection	on red-yellow border

This will confirm conductivity PCB operation. If meter readings do not agree with laboratory analysis, check the thermistor (10K resistance) and the cells.

## Replacing the RO Membrane

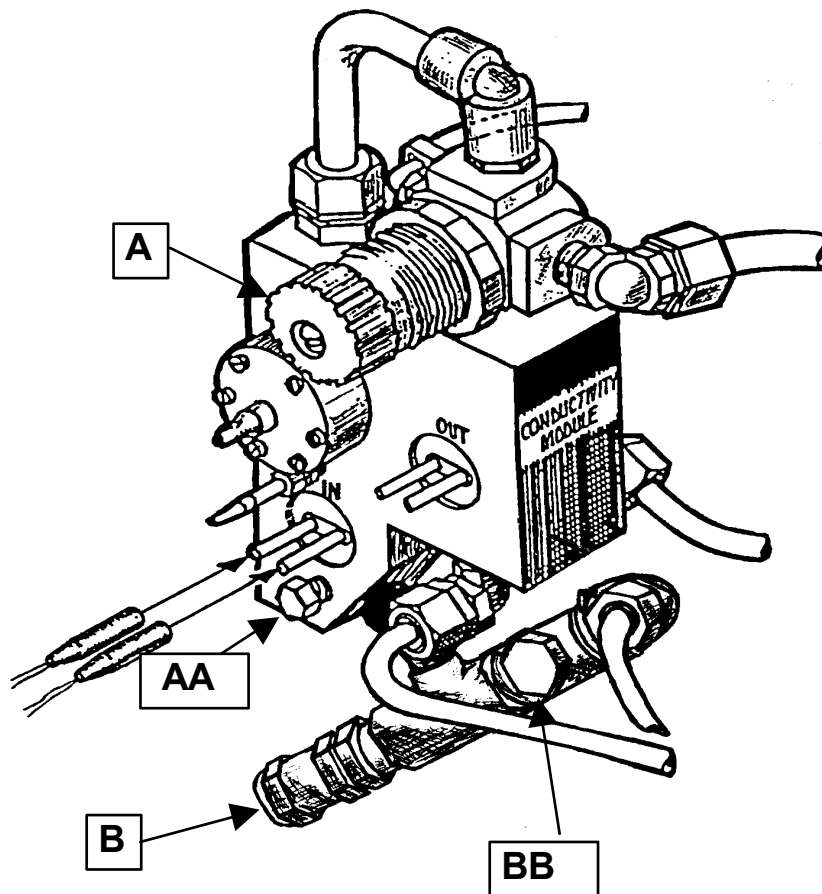
**CAUTION:** The following procedure should only be performed by a qualified technician. Call Baxter Instrument Service at 1-800-553-6898.

1. Turn off the RO and disconnect it from the water source and electrical outlet.
2. From the back of the unit, open the straps at the top and bottom of the vessel.
3. Once the pressure vessel is loose, lift it out of the bracket and lay it on its side on something (such as a wastebasket) to catch the water that will be draining out of the vessel.
4. Remove the compression fitting on the input water line located about 4" from the bottom of the vessel. Remove this fitting slowly. There still may be pressure in the line.

5. Using a flat blade screwdriver, remove the top snap-ring holding the top cap in place. Slowly pull the cap out of the top of the vessel using a rocking motion.
6. Remove the bottom snap-ring and end cap as in previous step. (This step is not necessary if you are able to remove the membrane through the top without difficulty.)
7. Remove the old membrane by pushing from the bottom or pulling from the top of the vessel.
8. Unpack and inspect the new membrane. The end with the U cup brine seal is the bottom of the membrane. Make sure the open side of the U cup brine seal faces upward toward the top.
9. Insert the new membrane into the vessel from the top. The U cup brine seal will allow the membrane to be inserted only in one direction. The bottom of the membrane inserts into the top of the vessel. If the membrane is difficult to insert, inspect the U cup brine seal to be sure it is oriented properly.
10. Replaced the two o-rings on the top and bottom end caps. (The part numbers for the o-rings are 408-8500-005 for the small o-ring and 408-8500-004 for the large o-ring.) After installing the o-rings, apply a light coat of high vacuum grease (part number 594-0001-019) to the o-rings.
11. Reinstall the top and bottom end caps and snap-rings, being careful not to damage the O-rings. Make sure the snap-rings are set in their respective grooves in the vessel.
12. Reinstall the vessel into the straps.
13. Connect the input water supply line to the vessel.
14. Turn on the unit long enough to let the vessel pressurize. You will notice the end caps move when the pressure builds up.

**WARNING: Do not stand directly above the RO while turning it on. If the snap-rings are not seated correctly, the end cap may fly off.**

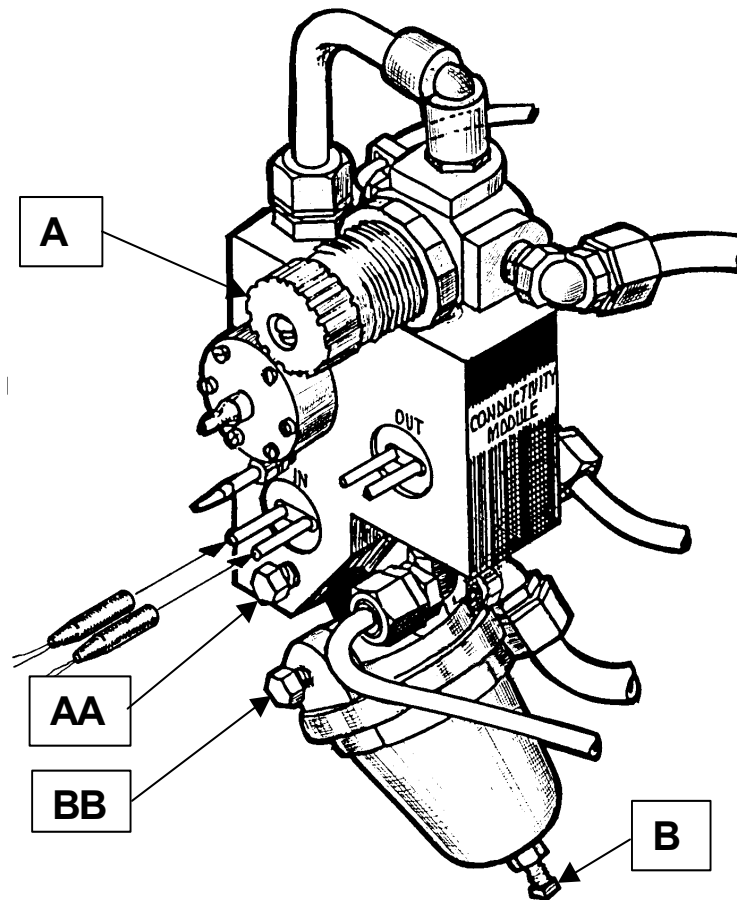
15. Check for leaks.
16. Return equipment to operation after sanitizing and rinsing.
17. Confirm the water quality prior to use.



## Pressure Adjustments for Hydrogen Peroxide/Peroxyacetic Acid Compatible System

**CAUTION:** The following procedure should only be performed by a qualified technician. Call Baxter Instrument Service at 1-800-553-6898.

1. Remove hole plugs in the conductivity cell block while the RO unit is off.
2. Install:
  - "AA" 0-30 psi gauge in the below recirculation cell.
  - "BB" 0-400 psi gauge in the hole on the high pressure regulator.
3. Turn the RO unit on and restrict product water flow to 500 cc/min.
  - "A" verify recirculation pressure is 21 to 24 psi. If not, adjust the low pressure regulator located above the block.
  - "B" verify RO module pressure is 200 psi. If not, adjust pressure using the high pressure regulator.
4. Remove gauges and replace the hole plugs.



## Pressure Adjustments for Formalin™ Compatible System

**CAUTION:** The following procedure should only be performed by a qualified technician. Call Baxter Instrument Service at 1-800-553-6898.

1. Remove hole plugs in the conductivity cell block while the RO unit is off.
2. Install:
  - "AA" 0-30 psi gauge in the below recirculation cell.
  - "BB" 0-400 psi gauge in the hole on the high pressure regulator.
3. Turn the RO unit on and restrict product water flow to 500 cc/min.
4. At point "A" verify recirculation pressure is 21 to 24 psi. If not, adjust the low pressure regulator located above the block.  
At point "B" verify RO module pressure is 200 psi. If not, adjust pressure using the high pressure regulator.
5. Remove gauges and replace the hole plugs.



## Conductivity Cell Connections

Damage or loosening of these connections could render the conductivity cell useless and result in erroneous water quality readings. The following are results obtained by simulating conductivity cell failure.

Conditions	% Rejection	Product	Recirculation
Product cell open	pegged right	pegged right	normal
Recirculation cell open	pegged left	slightly high, still in green scale	pegged right
Both cells open	lower, still in green scale	pegged right	pegged left

# **DIAGRAMS AND SCHEMATICS**

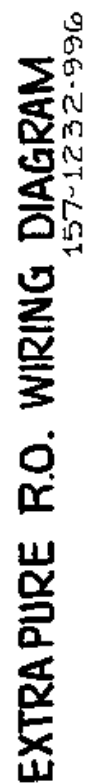
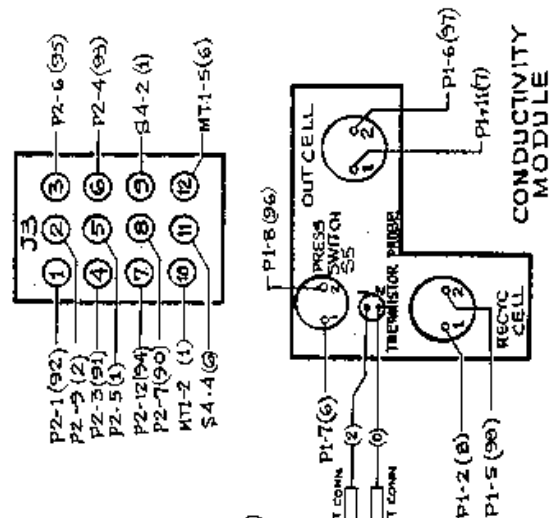
The following diagrams and schematics are contained in this section:

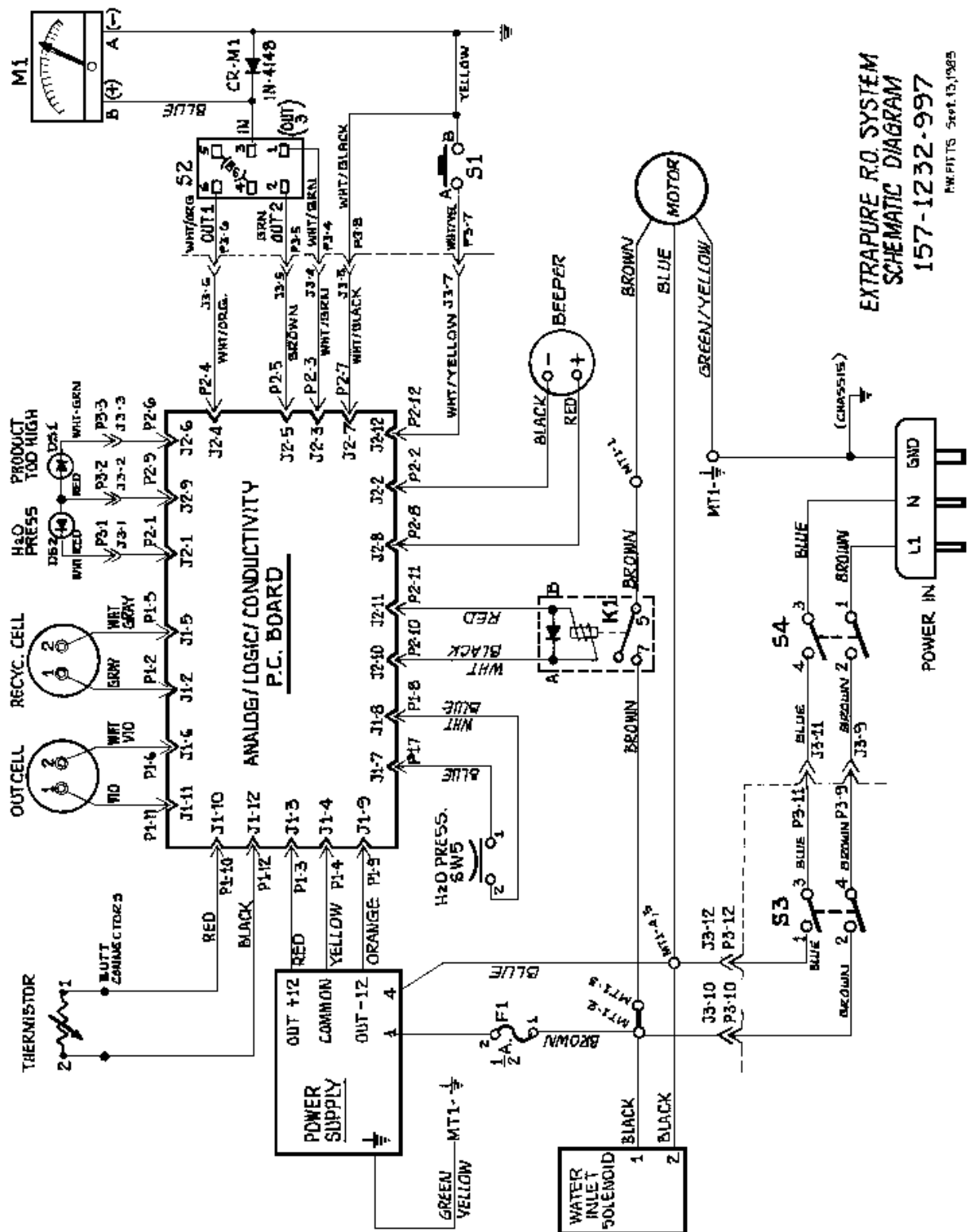
ExtraPure RO Wiring Diagram, 157-1232-996

ExtraPure RO System Schematic Diagram, 157-1232-997

Logic-Conductivity Circuit, 157-1232-994

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